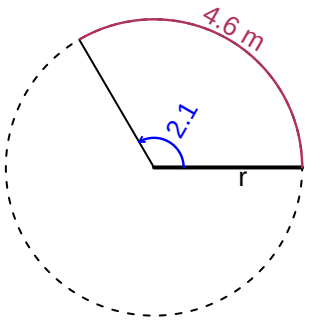
Name: Date:

Trig Final (Solution v26)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 4.6 meters. The angle measure is 2.1 radians. How long is the radius in meters?

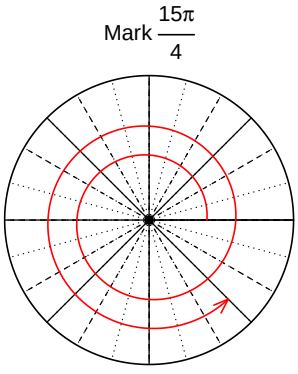


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

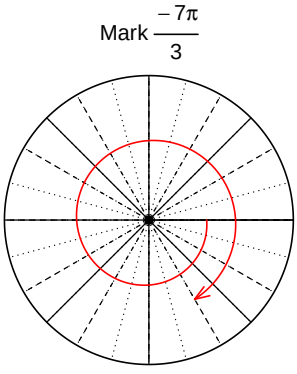
$r = 2.19$ meters.

Question 2

Consider angles $\frac{15\pi}{4}$ and $\frac{-7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{15\pi}{4}\right)$ and $\cos\left(\frac{-7\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(15\pi/4)$



Find $\cos(-7\pi/3)$

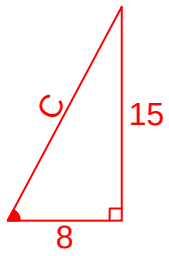
$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-7\pi/3) = \frac{1}{2}$

Question 3

If $\tan(\theta) = \frac{15}{8}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

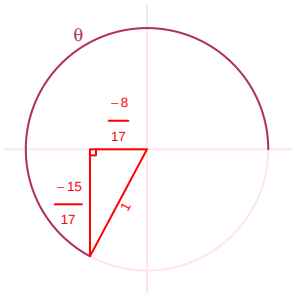
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$8^2 + 15^2 = C^2$$
$$C = \sqrt{8^2 + 15^2}$$
$$C = 17$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-8}{17}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 7.89 Hz, an amplitude of 3.95 meters, and a midline at $y = 6.66$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.95\sin(2\pi 7.89t) + 6.66$$

or

$$y = -3.95\sin(15.78\pi t) + 6.66$$

or

$$y = -3.95\sin(49.57t) + 6.66$$